

WE CLAIM:

1. A high loft, low density nonwoven web, the nonwoven web having x, y and z dimensions, with the x dimension being a machine direction, the y dimension being a cross machine direction and the z dimension being a loft direction, comprising:

a web of substantially continuous, spunbond, crimped, bicomponent fibers of A/B side by side morphology, the fibers being randomly crimped to produce a material of high loft and of low density with heterogeneous fiber orientation, including heterogeneous z-direction orientation to produce loft of the web, and irregularly spaced openings between the crimped fibers.

2. The high loft, low density nonwoven web according to Claim 1, wherein a basis weight of the web is between about 0.3 osy and about 25 osy.

3. The high loft, low density nonwoven web according to Claim 1, wherein a density of the web is between about 0.002 g/cc and about 0.05 g/cc.

4. The high loft, low density nonwoven web according to Claim 1, wherein the loft is between about 0.02 inches and about 1.50 inches.

5. The high loft, low density nonwoven web according to Claim 1, wherein the basis weight is about 0.5 osy and the loft is about 0.03 to about 0.3 inches and the density if from about 0.022 g/cc to about 0.002 g/cc.

6. The high loft, low density nonwoven web according to Claim 1, wherein the basis weight is about 3.0 osy and the loft is from about 0.1 inches to about 1.5 inches and the density is from about 0.04 g/cc to about 0.003 g/cc.

7. The high loft, low density nonwoven web according to Claim 1, wherein the fibers exhibit substantially regular waving at a first major surface of the web.

8. The high loft, low density nonwoven web according to Claim 1, wherein the fibers exhibit z-direction buckling at a substantially constant frequency.

9. The high loft, low density nonwoven web according to Claim 1, wherein the fibers comprise polypropylene and polyethylene polymers.

10. The high loft, low density nonwoven web according to Claim 1, wherein the fibers comprise polymers selected from the group including PET, Copoly-PP+3%PE, PLA, PTT, Nylon, and PBT.

11. The high loft, low density nonwoven web according to Claim 1, wherein the fibers comprise cross sectional shapes selected from the group including Pentaloble, Tri-T, Hollow, Ribbon, X, Y, H, and asymmetric.

12. The high loft, low density nonwoven web according to Claim 1, wherein the fibers are integrally bonded to each other in the web.

13. A high loft, low density nonwoven web, the nonwoven web having x, y and z dimensions, with the x dimension being a machine direction, the y dimension being a cross machine direction and the z dimension being a loft direction, comprising:

a web of substantially continuous, spunbond, crimped, bicomponent fibers of A/B side by side morphology, the fibers being randomly crimped to produce a lofted material with heterogeneous fiber orientation, including substantially heterogeneous z-direction orientation and shingled layers of buckled Z-orientation zones to produce loft of the web.

14. A high loft, low density nonwoven web, the nonwoven web having x, y and z dimensions, with the x dimension being a machine direction, the y dimension being a cross machine direction and the z dimension being a loft direction, consisting of:

a web of substantially continuous, spunbond, crimped, bicomponent fibers of A/B side by side morphology, the fibers being randomly crimped to produce a lofted material with heterogeneous fiber orientation, including heterogeneous z-direction orientation to produce loft of the web, and irregularly spaced openings between the crimped fibers.

15. A method for producing a high loft, low density nonwoven web, the nonwoven web having x, y and z dimensions, with the x dimension being a machine direction, the y dimension being a cross machine direction and the z dimension being a loft direction, comprising:

- a) forming a group of crimpable, substantially continuous, spunbond, bicomponent fibers of A/B side by side morphology in an unheated FDU and depositing the group of fibers onto a forming wire;
- b) first heating the fibers at a time and a temperature sufficient to induce a relaxation of molecular orientation of one side of the fiber;
- c) after said first heating, cooling the group of fibers below the temperature where the fibers will bond to each other and thereby inducing the fibers to crimp; and
- d) controlling or minimizing the forces which tend to impede crimping of the fibers when performing steps b) and c) whereby the fibers are allowed to crimp in the z-direction.

16. The method for producing a high loft, low density nonwoven web according to Claim 15, further comprising: reheating the group of fibers to cause the fibers to bond to each other to form a stable high loft, low density nonwoven web.

17. The method for producing a high loft, low density nonwoven web according to Claim 15, further comprising: reheating the group of fibers under heating or air flow conditions, or both, sufficient to maintain an original loft height of the group of fibers after steps b) and c).

18. The method for producing a high loft, low density nonwoven web according to Claim 17, wherein the reheating heat is less than or equal to about 450 degrees F.

19. The method for producing a high loft, low density nonwoven web according to Claim 17, wherein there is no induced air movement during the reheating.

20. The method for producing a high loft, low density nonwoven web according to Claim 15, wherein the group of fibers is carried through the reheating zone at a velocity of greater than or equal to about 25 fpm.

21. The method for producing a high loft, low density nonwoven web according to Claim 15, further comprising: reheating the group of fibers under heating or air flow conditions, or both, sufficient to reduce an original loft height of the group of fibers after steps b) and c).

22. The method for producing a high loft, low density nonwoven web according to Claim 15, further comprising: nonfunctionally bonding the group of fibers before the first heating.

23. The method for producing a high loft, low density nonwoven web according to Claim 15, further comprising: applying a vacuum under the wire where the fibers are deposited on the forming wire.

24. The method for producing a high loft, low density nonwoven web according to Claim 23, further comprising: removing or reducing the vacuum under the forming wire after the first heating.

25. The method for producing a high loft, low density nonwoven web according to Claim 15, further comprising: removing or reducing blowing air during steps b) and c).

26. The method for producing a high loft, low density nonwoven web according to Claim 15, further comprising: applying the fibers to the forming wire with a high degree of machine direction orientation.

27. An acoustic insulation material comprising the high loft, low density nonwoven web according to Claim 1.

28. An acoustic insulation material comprising the high loft, low density nonwoven web according to Claim 13.

29. An acoustic insulation material comprising the high loft, low density nonwoven web according to Claim 14.

30. A thermal insulation material comprising the high loft, low density nonwoven web according to Claim 13.

31. A thermal insulation material comprising the high loft, low density nonwoven web according to Claim 14.

32. The high loft, low density nonwoven web according to Claim 1, further comprising particulates contained within the web.

33. The high loft, low density nonwoven web according to Claim 13,
further comprising particulates contained within the web.

34. The high loft, low density nonwoven web according to Claim 14,
further comprising particulates contained within the web.